

CLAIMS

1 1. A method for estimating the latency of aperiodic tasks in systems
2 with simultaneous scheduling of aperiodic messages and periodic
3 transmissions on a common bus, comprising the steps of:

4 (a) using predefined periodic transmission times, calculating
5 data transition points between periodic and aperiodic message
6 transmissions intervals for hyperperiods of interest in said system;

7 (b) using said data transition points to produce a series of
8 aperiodic latency estimation inflection points;

9 (c) collecting data points of aperiodic message transmissions for
10 hyperperiods of interest in said system; and

11 (d) estimating the aperiodic latency probability at an inflection
12 point in said hyperperiod as being equal to the number of sample data
13 points less than or equal to the said inflection point divided by the total
14 number of collected aperiodic latency sample data points, said data
15 points forming a data point plot that is assumed to be linear between
16 said aperiodic latency inflection points.

1 2. The method of claim 1, wherein said data points are plotted on
2 the X axis of a graph and the empirical probability that the latency
3 exceeds the time is plotted on the Y axis of said graph, such that latency
4 estimation inflection points are selected along said X axis for said
5 hyperperiod to visually represent values at which higher priority
6 periodic message traffic will impact or cause a point of inflection on
7 aperiodic latencies.

1 3. The method of claim 1, wherein said aperiodic latency estimation
2 inflection points are formed by binning said aperiodic data points using
3 fluid flow analysis dependent only on the timeline defined by periodic
4 traffic.

1 4. The method of claim 3, wherein said fluid flow analysis employs an
2 algorithm.

1 5. In a method for estimating the latency of aperiodic tasks in
2 systems with simultaneous scheduling of aperiodic messages and
3 periodic transmissions on a common bus, wherein predefined periodic
4 transmission times are used to calculate data transition points between
5 periodic and aperiodic message transmissions intervals for hyperperiods
6 of interest in said system, data points of aperiodic message
7 transmissions for hyperperiods of interest in said system are collected
8 and the aperiodic latency probability at an inflection point in said
9 hyperperiod is estimated as being equal to the number of sample data
10 points less than or equal to the said inflection point divided by the total
11 number of collected aperiodic latency sample data points, said data
12 points forming a data point plot that is assumed to be linear between
13 said aperiodic latency inflection points, the improvement comprising:
14 using said data transition points to produce a series of aperiodic
15 latency estimation inflection points.

6. The method of claim 5, wherein said data points are plotted on the X axis of a graph and the empirical probability that the latency exceeds the time is plotted on the Y axis of said graph, such that latency estimation inflection points are selected along said X axis for said hyperperiod to visually represent values at which higher priority periodic message traffic will impact or cause a point of inflection on aperiodic latencies.

7. The method of claim 5, wherein said aperiodic latency estimation inflection points are formed by binning said aperiodic data points using fluid flow analysis dependent only on the timeline defined by periodic traffic.

8. The method of claim 7, wherein said fluid flow analysis employs an algorithm.

9. A system for simultaneous scheduling aperiodic messages and periodic transmissions on a common bus, comprising:

(a) means for calculating data transition points between periodic and aperiodic message transmissions intervals for hyperperiods of interest in said system using predefined periodic transmission times;

(b) means for using said data transition points to produce a series of aperiodic latency estimation inflection points;

(c) means for collecting data points of aperiodic message transmissions for hyperperiods of interest in said system; and

10 (d) means for estimating the aperiodic latency probability at an
11 inflection point in said hyperperiod as being equal to the number of
12 sample data points less than or equal to the said inflection point divided
13 by the total number of collected aperiodic latency sample data points,
14 said data points forming a data point plot that is assumed to be linear
15 between said aperiodic latency inflection points.

1 10. The system of claim 9, wherein said data points are plotted on the
2 X axis of a graph and the empirical probability that the latency exceeds
3 the time is plotted on the Y axis of said graph, such that latency
4 estimation inflection points are selected along said X axis for said
5 hyperperiod to visually represent values at which higher priority
6 periodic message traffic will impact or cause a point of inflection on
7 aperiodic latencies.

1 11. The system of claim 9, wherein said aperiodic latency estimation
2 inflection points are formed by binning said aperiodic data points using
3 fluid flow analysis dependent only on the timeline defined by periodic
4 traffic.

1 12. The system of claim 9, wherein said fluid flow analysis employs an
2 algorithm.